

Welcome to Germany

Welcome at Potsdam

Part 1

Climate Data & Diagnostic

RD1

EARTH SYSTEM ANALYSIS

Atmosphere, Ocean, Ice Sheet & Vegetation



Multi-sector Impacts and Climate Extremes

CLIMATE IMPACTS AND VULNERABILITIES

RD2

RD3

SUSTAINABLE SOLUTIONS

Global Adaption Strategies, Policy Assessment



Complex Networks and Visualization

TRANSDISCIPLINARY CONCEPTS & METHODS

RD4

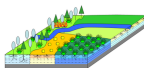
Models/Tools at compute cluster:



Potsdam Earth Model



Parallel Ice Sheet Model



Lund-Potsdam-Jena managed Land



COSMO-ClimateLimited-areaModelling



Soil and Water Integrated Model



FORESt Ecosystems in a Changing Environment



Outline:

① Climate Data

- ① from global to national: access ++ costs ++ handling

② Climate Diagnostic

- ① from global to local: circulation pattern ++ extremes

③ Climate Scenarios

- ① from global to regional: dynamical/statistical ++ access ++ bias correction

④ Weather in Climate Models

- ① objectivation of European circulation pattern
- ② assessment of climate models

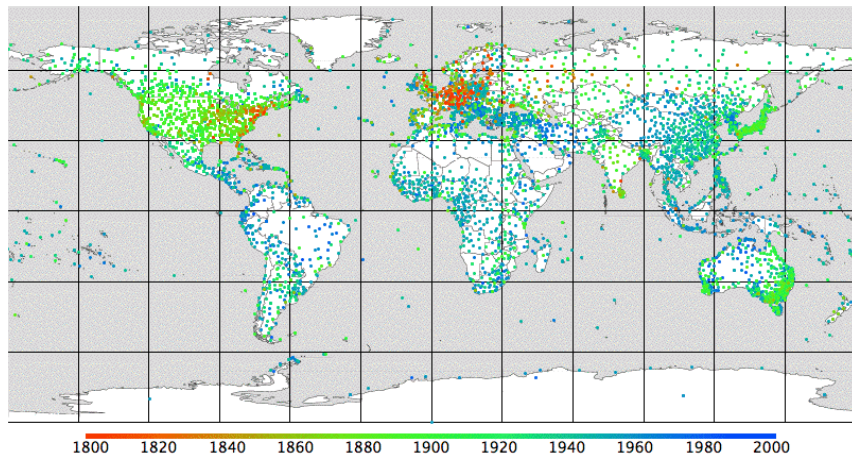
Climate Data:

Scale	Dataset		Access	Costs	Usage
global	WATCH	daily	consortium	—	ISI-MIP
	CRU	monthly	consortium	—	Studies
	WDC	monthly	connection	5000 €/yr	Studies
regional	E-OBS	daily	free access	—	Monitoring
national	DWD	hourly/daily	limited access	250 €/yr	Swim-live
					downscaling
global	GFS/CFS	3 hourly	free access	—	forecasting

- Data handling:

- ▶ exchange via ftp and wget
- ▶ interactive programming languages: R & Python

Climate Data: global



GCHN Database, as used by CRU and NCDC

Climate Data: monthly climate data

WDC, Obninsk

Ethiopia (Part B)(63300- 63599)

6333120150208055199999902281089199999999999903101015010901
6340220150208367199999902001124105101691194103161008412121
6347120150208865199999902461125199900001017103231016912721

Kenya & Tanzania (United Republic of) & Uganda(63600- 63979)

6375620150208858199999902401214104100361999902891999992401
6383220150208826199999902341215110100841999902981015912351
6396220150208950199999902261219112100751001102861015111731
6397120150209979110107102731295103100961999903091023712451

Zaire|(64000- 64379)

6421020150209753110101102631277110102411999903171022619999

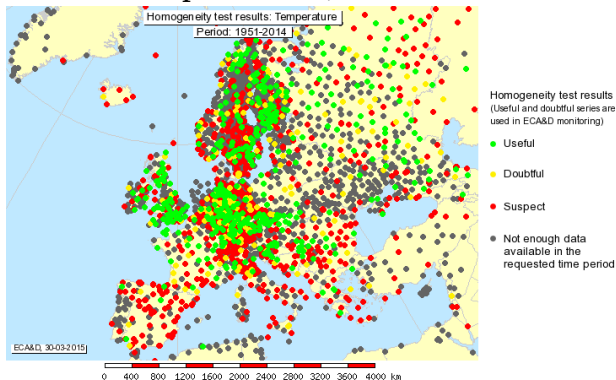
NST(5) + YEAR(4) + MONTH(2) + P0(6:0.1mb) + P(6:0.1mb) + TMEAN(5:0.1°C) + VAP(4:0.1mb) +
N(3:>1mm) + R(5:1mm) + ST(4) + TMAX(5:0.1°C) + TMIN(5:0.1°C) + SUN(4:1h)



Station_list: 637560 HTMW MWANZA TN -0246 +03291 1140

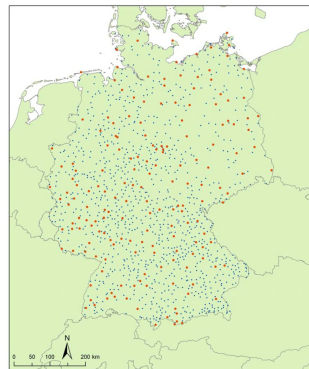
Climate Data: regional to national

Europe (E-OBS, $0.25^\circ \times 0.25^\circ$)



ca. 250 useful stations

Germany (DWD)



180 & 1038

Climate Data: Access



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Miscellaneous

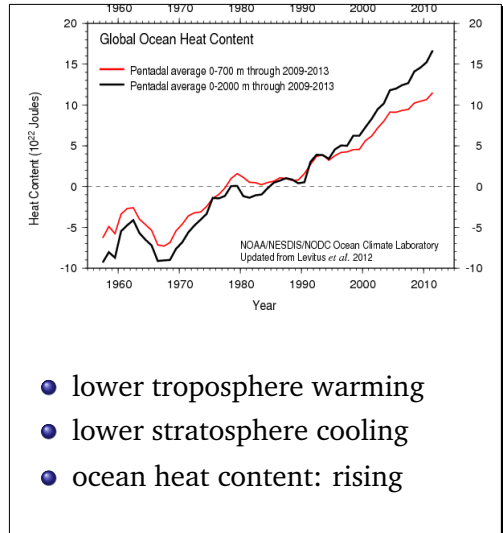
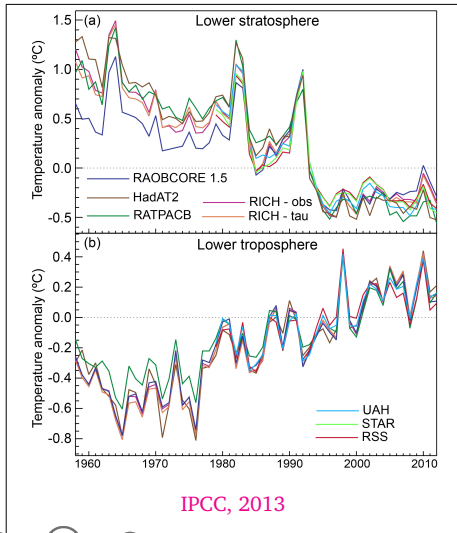
Matches: 59

[First page](#) | [Previous 15](#) | [1 - 15 of 59](#) | [Next 15](#) | [Last page](#)

Product ID	Title	Product	Metadata	XML	Example
de.dwd.cpd.rcm	Regional Climate Projections				-
de.dwd.hydromet.owlk.climate	oWLK-GCM objective weather types derived from General Circulation Models (Reanalysis data and Global Climate Model Simulations)				-
de.dwd.nkdz.collections	Time series of different meteorological elements provided on files related to the federation states of Germany and some 1-km-grid fields for download				-
de.dwd.nkdz.DDHM	Climatological time serie: hourly means of wind direction (in degrees)				-
de.dwd.nkdz.FBDM	Climatological time serie: daily mean of windforce (in Bft)				-
de.dwd.nkdz.FFDM	Climatological time serie: daily mean of windspeed (in m/sec)				-
de.dwd.nkdz.FFDX	Climatological time serie: daily maximum of windspeed (in m/sec)				-
de.dwd.nkdz.FFHM	Climatological time serie: hourly means of wind speed (in m/sec)				-
de.dwd.nkdz.HRRMS	monthly sums of precipitation (homogeneous) (in mm)				-
de.dwd.nkdz.HTAMM	monthly means of air temperature (homogeneous) (in degree C)				-

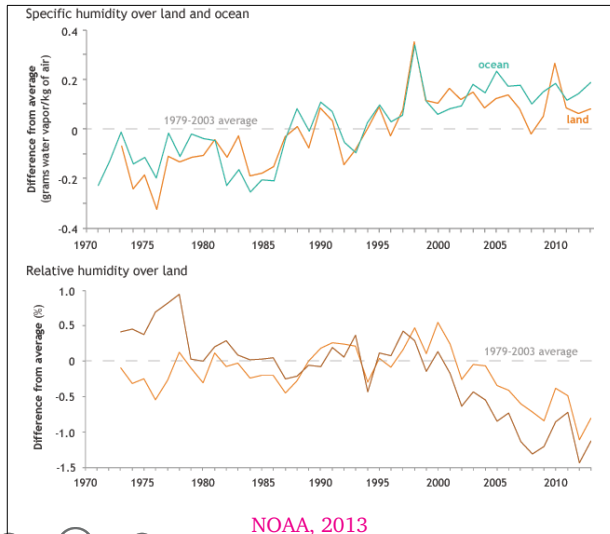


Climate Diagnostic: Temperature (Atmos./Ocean)

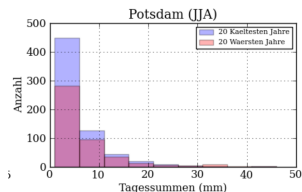


- lower troposphere warming
- lower stratosphere cooling
- ocean heat content: rising

Climate Diagnostic: Humidity (global)



- specific humidity (g/km)
 - ▶ rising
 - ▶ more wv in atmosphere
- relative humidity (%)
 - ▶ falling
 - ▶ condensation level rises
- if its rain than more heavy
- shift of the precipitation spectrum

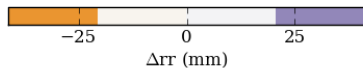
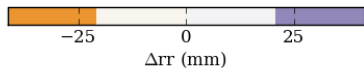
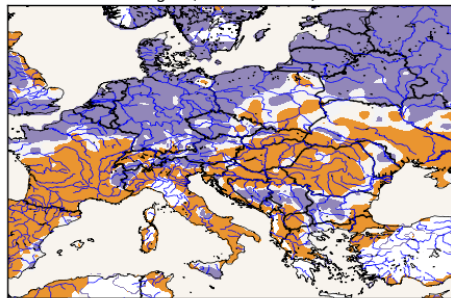
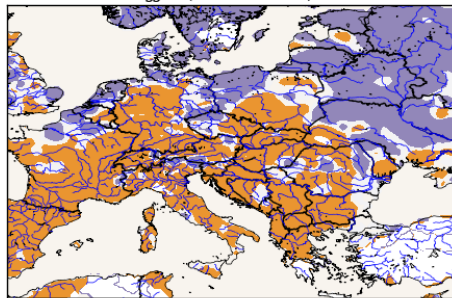


Climate Diagnostic: Precipitation (Europe)

1984-2013 — 1951-1980

JJA (8413-5180)

DJF (8413-5180)

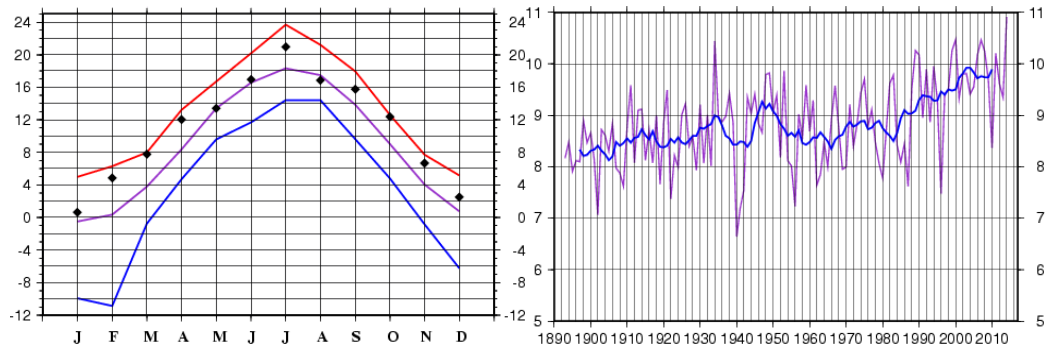


Summer

E-OBS

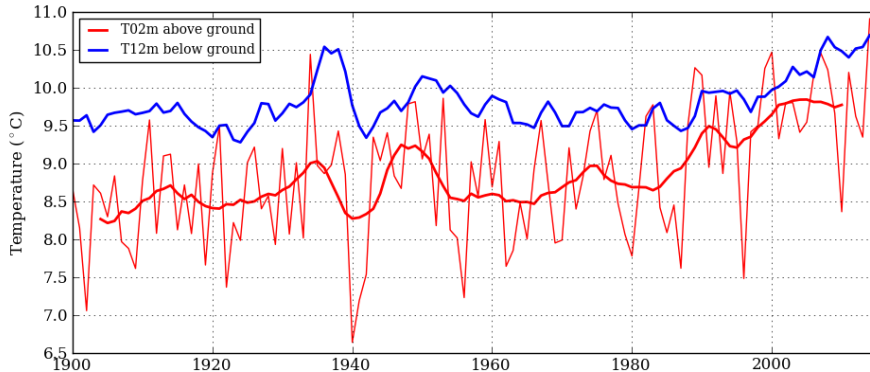
Winter

Climate Diagnostic: Potsdam



2014: the warmest year on record (10.91°C)
globally, in Europe and in Germany

Climate Diagnostic: Potsdam



annual mean Temperature
2m-Temperature and 12m Temperature below ground

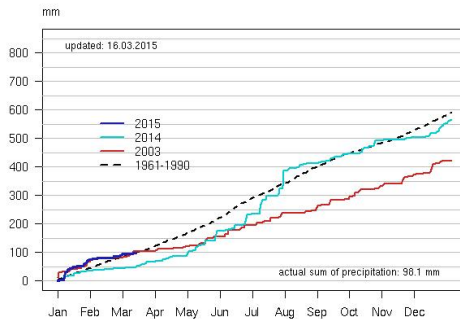
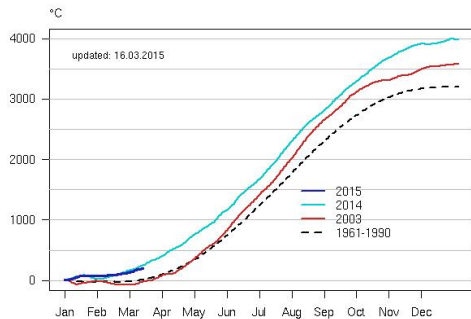
Climate Diagnostic: Potsdam

• year	• Jan	• Feb	• Mar	• Apr	• May	• Jun
	• Jul	• Aug	• Sep	• Oct	• Nov	• Dec
show						
date	highest daily maximum of air temperature in year					
9. 8.1992	39.1 °C					
11. 7.1959	38.4 °C					
10. 7.1959	38.2 °C					
11. 7.2010	38.0 °C					
1. 8.1994	37.7 °C					

• year	• Jan	• Feb	• Mar	• Apr	• May	• Jun
	• Jul	• Aug	• Sep	• Oct	• Nov	• Dec
show						
date	lowest daily minimum of air temperature in year					
11. 2.1929	-26.8 °C					
10. 2.1929	-26.0 °C					
19. 1.1893	-25.7 °C					
21.12.1969	-24.5 °C					
18. 1.1893	-24.3 °C					

• year	• Jan	• Feb	• Mar	• Apr	• May	• Jun
	• Jul	• Aug	• Sep	• Oct	• Nov	• Dec
show						
date	highest daily total of precipitation in year					
8. 8.1978	105.7 mm					
12. 8.2002	83.9 mm					
9. 7.1927	83.1 mm					
29. 8.1969	79.2 mm					
25. 6.1940	69.2 mm					

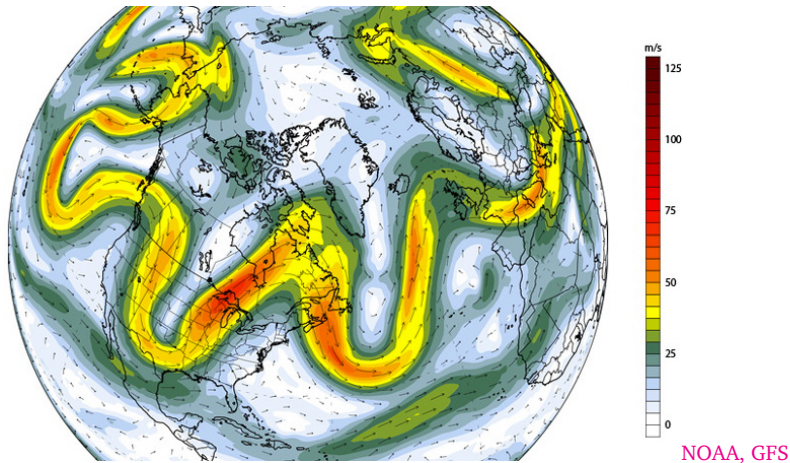
Climate Diagnostic: Potsdam



2015: cumulative charts

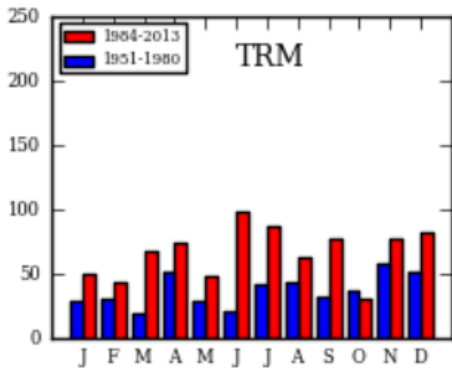
Temperature (left) and Precipitation (right)

Climate Diagnostic: Jetstream



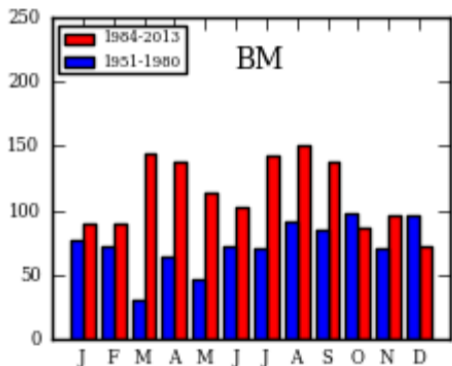
weather driver

Climate Diagnostic: Weather Situations



”Trough over Central Europe”
increasing

Climate Diagnostic: Weather Situations



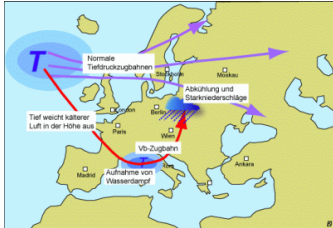
Hochdruckbrücke Mitteleuropa
23. Januar 1981



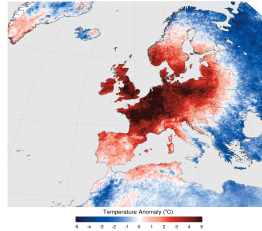
”High Bridge over Central Europe”
increasing

Climate Diagnostic: Extreme Weather Events

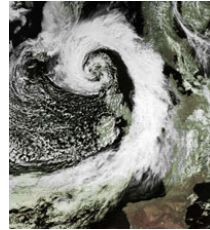
Floods



Heatwaves



Storms



Thunderstorms



Black Ice



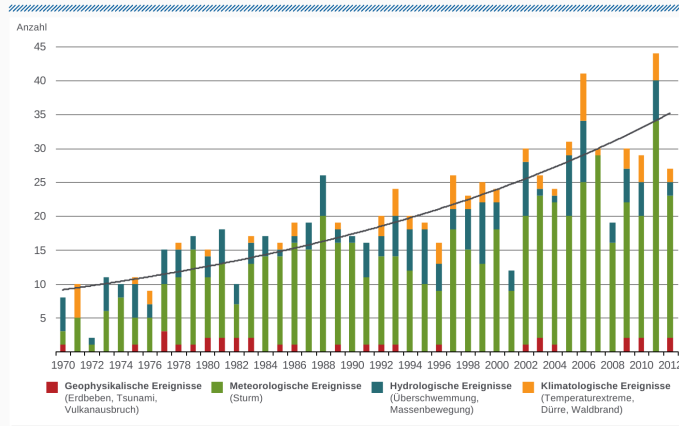
Climate Diagnostic: Natural Disasters

NatCatSERVICE

Naturkatastrophen in Deutschland 1970 – 2012

Anzahl der Ereignisse mit Trend

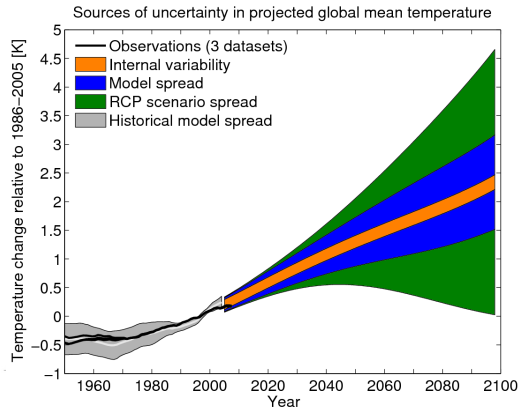
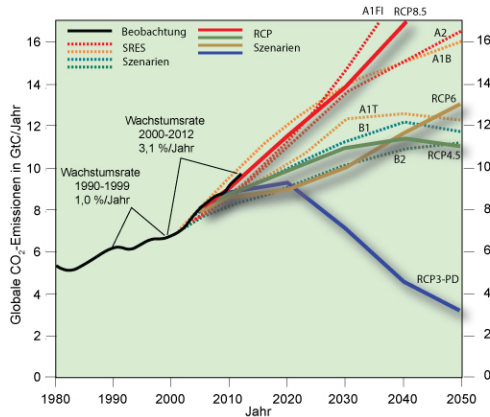
Munich RE 



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Munich RE, 2013

Climate Scenarios: Emissions & Temperature



IPCC, 2013

RCP 8.5 (business as usual scenario): $4K \pm 0.5$
the most likely one



Climate Scenarios: ESGF



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[\(x\) domain:EUR-11](#)
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[\(x\) time frequency:day](#)
[\(x\) driving model:MPI-M-MPI-ESM-LR](#)
[\(x\) query:tas](#)

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Temporal Search
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constraints and
datacan
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Vocabulary

Examples: *temperature*, *"surface temperature"*, *climate AND project:CMIP5 AND variable:hus*.
To download data: add datasets to your Data Cart, then click on *Expand* or *wget*.

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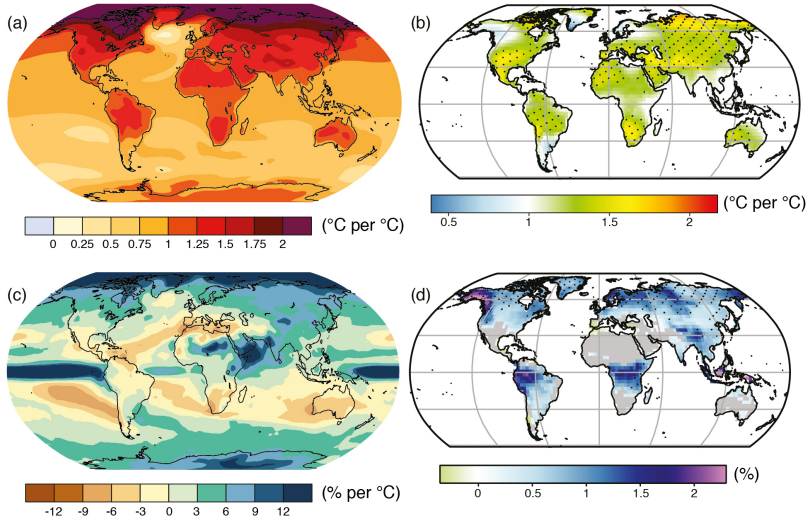
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[cordex.output.EUR-11.CLMcom.MPI-M-MPI-ESM-LR.rcp85.r1i1p1.CCLM4-8-17.v1.day.tas](#)
Data Node: carbon.dkrz.de
Version: 20140515
No description available.
Further options: [Add To Cart](#) [Visualize and Analyze](#)

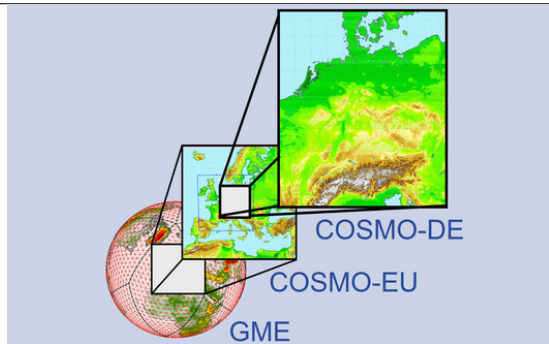
Climate Scenarios: global (1° warming level)



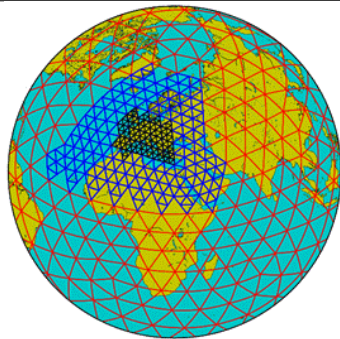
IPCC, 2013

Climate Scenarios: downscaling

CMIP5 → Cordex



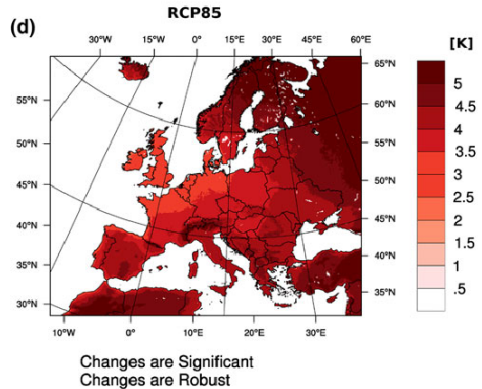
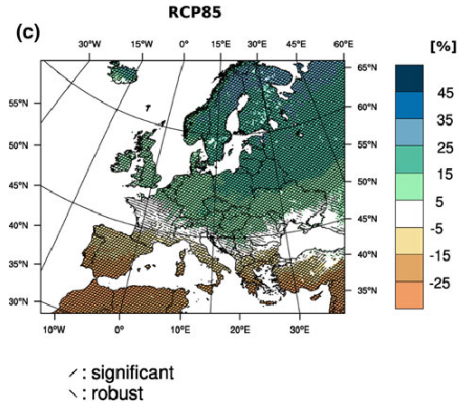
ICON



DWD

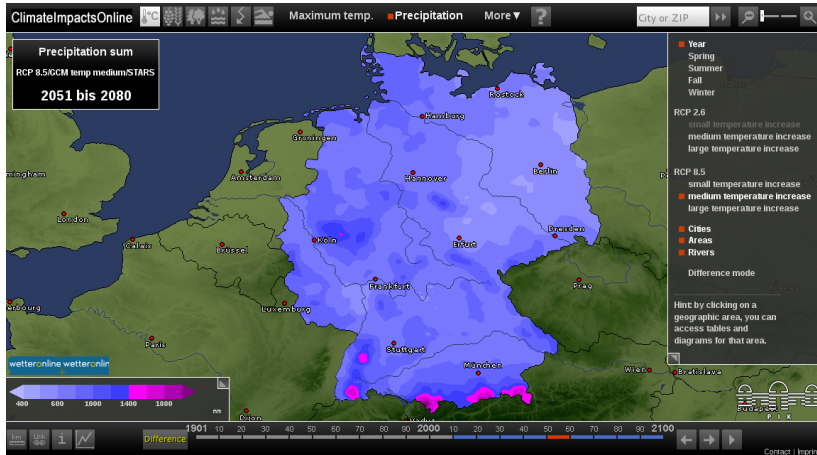
dynamical downscaling

Climate Scenarios: regional



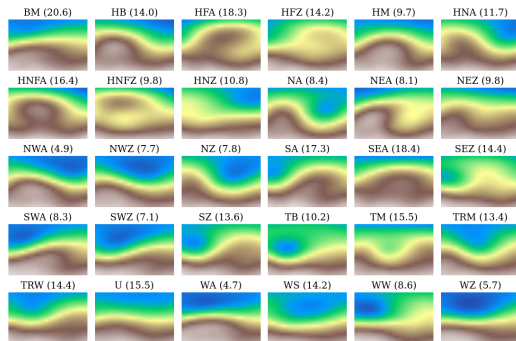
Jacob et al. 2013

Climate Scenarios: national



ClimateImpactsOnline

Weather in Climate Models: Pattern in Reanalyses

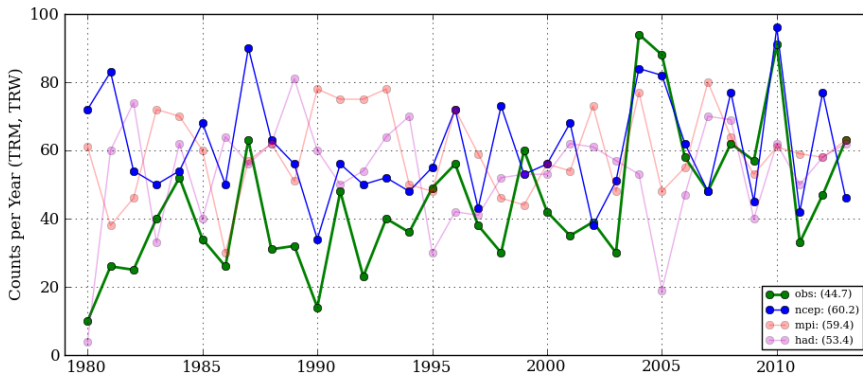


WZ	Cyclonic Westerly
SWA	Anticyclonic South-Westerly
NWZ	Cyclonic North-Westerly
HM	High over Central Europe
BM	Zonal Ridge across Central Europe
TM	Low (Cut-Off) over Central Europe
NA	Anticyclonic Northerly
NZ	Cyclonic Northerly
HB	High over the British Isles
TRM	Trough over Central Europe
SA	Anticyclonic Southerly
SZ	Cyclonic Southerly
TB	Low over the British Isles
TRW	Trough over Western Europe

European circulation pattern at GPH500
Climatology

Weather in Climate Models: long-term Trends

Identification of European circulation pattern via image comparison “Trough over Europe”



observation/reanalyses



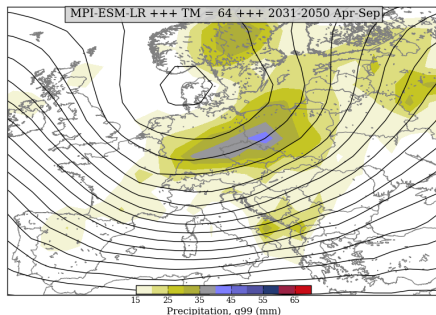
climate models



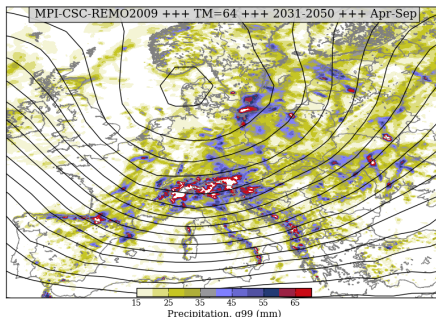
Weather in Climate Models: Applications

Low over Central Europe (TM)

GCM



RCM

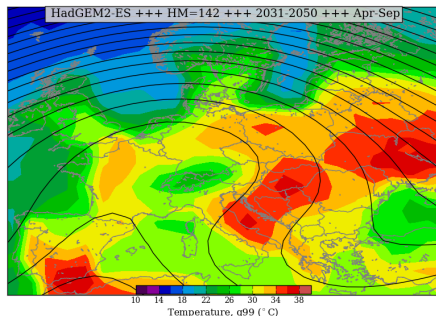


heavy precipitation

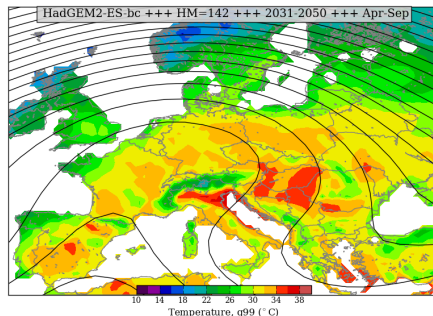
Weather in Climate Models: Applications

High over Central Europe (HM)

GCM uncorrected

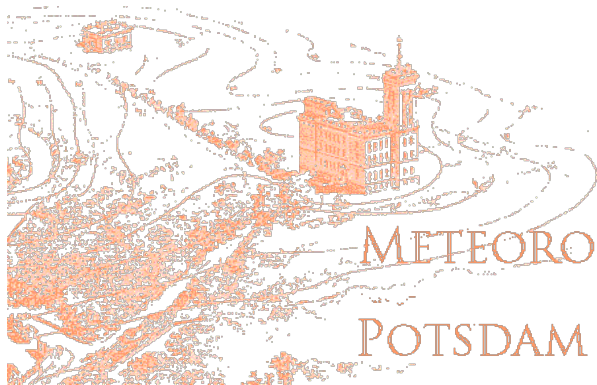


GCM corrected



temperature extreme

INVITATION TO VISIT



LONG-TERM
METEOROLOGICAL STATION
POTSDAM TELEGRAFENBERG



- 100 year without gaps (81m)
- unchanged measurement and boundary conditions
- recording of the most important meteorol. values
- jewel among the meteorol. long-term series worldwide
- first official weather observation: 1st Jan 1893
- Reinhard Süring: director from 1909 for 23+5 years
- record ballon ascend: 31st July 1901 (10.800m)
- Süring died in the age of 85 years (1951)
- 2020: DWD plans to say goodbye from visual observ.

The long-term station Potsdam is the only one worldwide measuring before 1900:

- soil temperature + snow cover + frost depth + Tmin near ground + cloud forms + sight + precip. kind

Measurement Programme:

- soil temperature: 2cm, 5cm, 10cm, 20cm, 50cm, 1m, 2m, 4m, 6m, 12m